

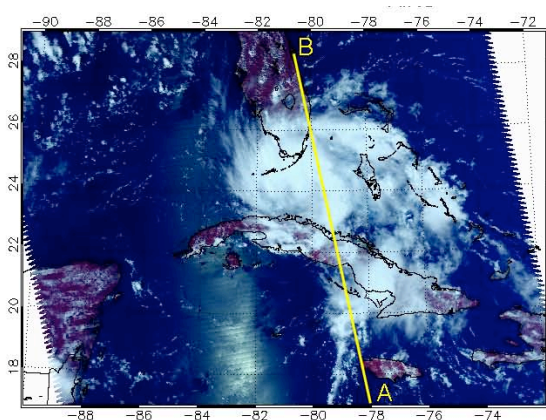
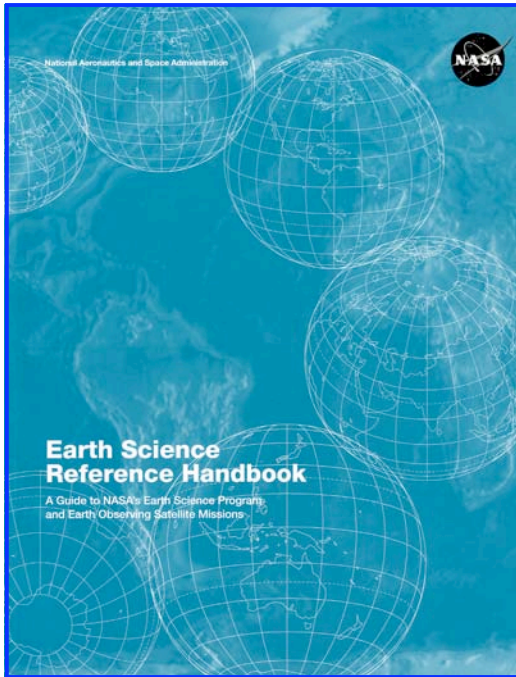
A detailed 3D rendering of the Aqua satellite, showing its complex structure with various instruments, a large white parabolic antenna, and large solar panel arrays. The satellite is depicted in a three-quarter view, highlighting its intricate design and the arrangement of its components.

Aqua Program Status

Claire L. Parkinson
Aqua Project Scientist

AIRS Science Team Meeting
Marriott Hotel, Greenbelt, Maryland
September 26, 2006

Key Recent Aqua and Related Activities



August 29, 2006 AIRS image of Tropical Storm Ernesto from the A-Train Data Depot

- July 2006: Earth Science Reference Handbook published.
- August 7, 2006: Aqua science briefing at NASA HQ.
- August 16, 2006: Terra/Aqua budget discussion at NASA HQ.
- August/September 2006: Aqua and other A-Train inclination adjust maneuvers (IAMs).
 - Four of six Aqua IAMs completed (August 22, 29; September 7, 12).
 - Some unexpected changes in the semi-major axis, running the risk of Aqua's moving out of its control box if more IAMs are performed now.
 - Remaining Aqua IAMs delayed until Spring 2007.
- September 2006: Highlighting of AIRS and other data on the new A-Train Data Depot website, at disc.sci.gsfc.nasa.gov/atdd/.

Upcoming

- Considerations of automating more of the mission control operations, in particular implementing auto ops for the solid state recorder.
 - Benefits: Cost savings; prevent data losses due to communication failures with the ground stations (e.g., the 3 hour 39.5 minute data loss on June 7, 2007 and the 6 hour 43.5 minute data loss on July 5, 2006; all previous data losses had totaled just under 5 hours 3 minutes).
 - Negatives: Some partial data packets.
- Possibilities for an extended mission.
 - Enough fuel to last at least until 2015.
 - Need funding.
- Senior Review.
 - Likely late March 2007.
 - Instructions expected soon from Steve Volz.

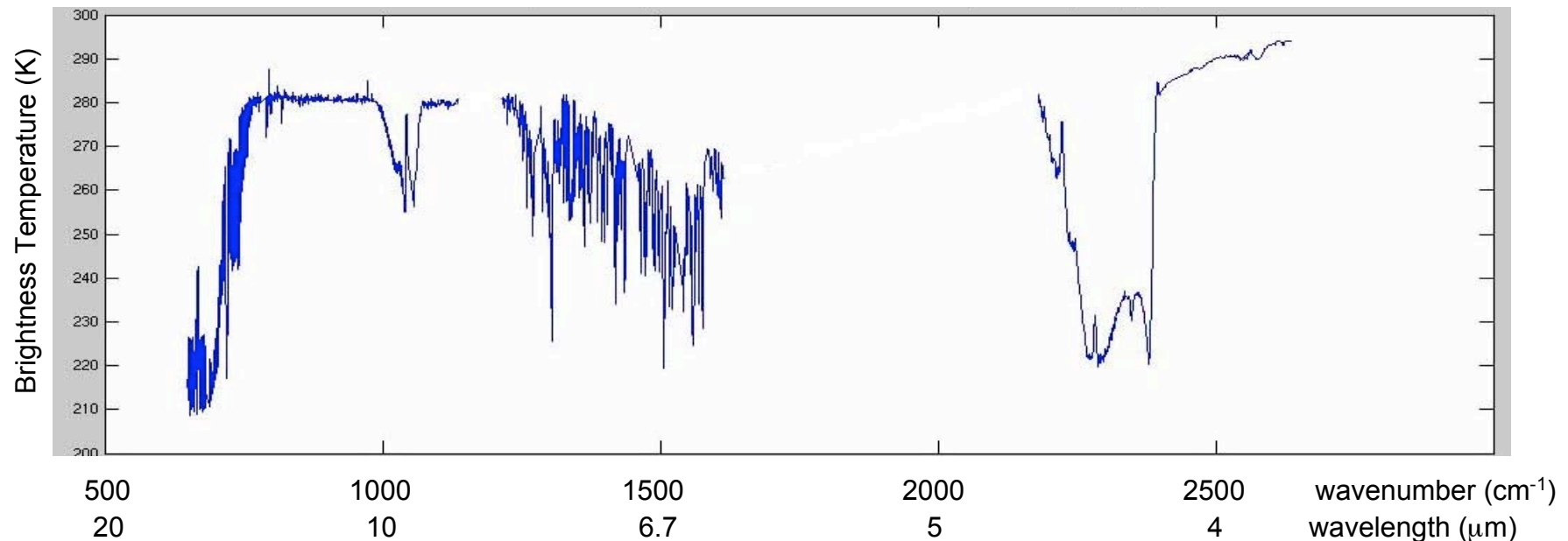
Aqua Mission Success Criteria

1. Produce the first high spectral resolution global infrared spectra of the Earth.
2. Obtain a highly accurate temperature profile of the troposphere.
3. Extend the improved TRMM rainfall characterization to the extra tropics.
4. Produce the first global sea surface temperature daily maps under nearly all sky conditions for a minimum of 1 year.
5. Produce large-scale global soil moisture distribution for regions with low vegetation.
6. Produce calibrated global observations of the Earth's continents and ocean surfaces.
7. Capture and document two seasonal cycles of terrestrial and marine ecosystems and atmospheric and cloud properties.
8. Produce two seasonal/annual Earth radiation budget records.
9. Produce improved measurements of the diurnal cycle of radiation by combining Aqua and Terra measurements.
10. Produce combined cloud property and radiation balance data to allow improved studies of the role of clouds in the climate system.

1. Produce the first high spectral resolution global infrared spectra of the Earth.

Status: This was accomplished by the AIRS Science Team in October 2002.

Sample AIRS infrared spectrum, showing all 2378 AIRS infrared channels for one footprint off the west coast of South Africa, June 13, 2002, 1:30 UTC.

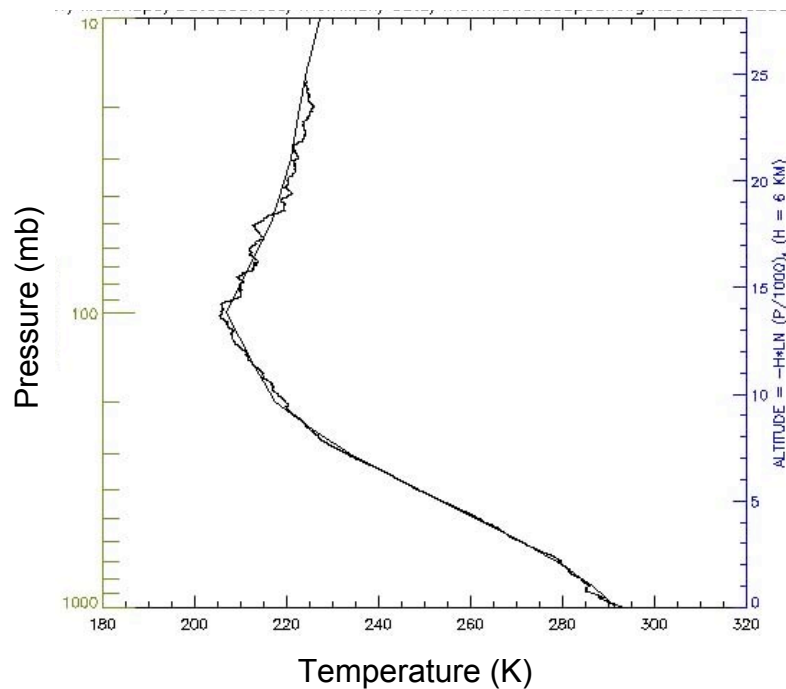


(spectrum from Mous Chahine and the AIRS Science Team)

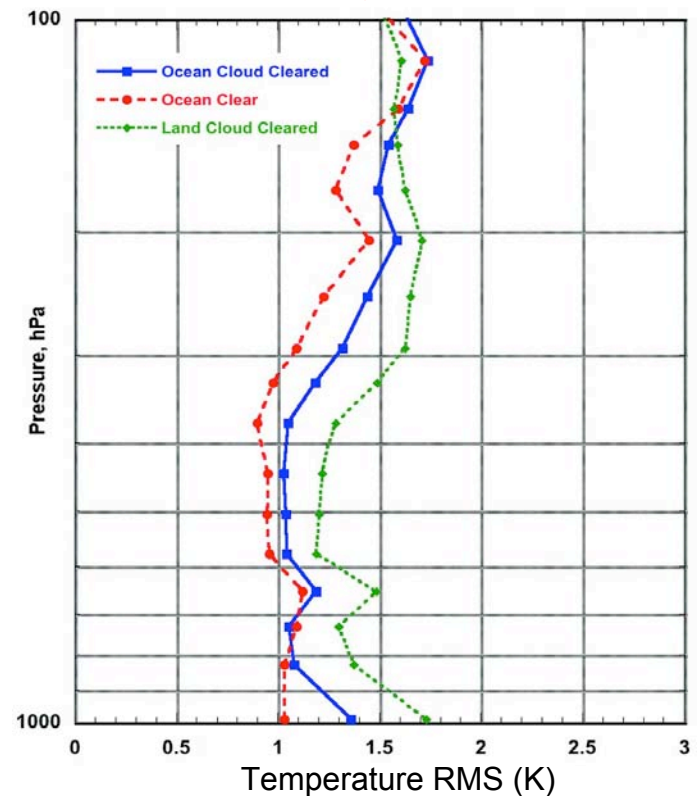
2. Obtain a highly accurate temperature profile of the troposphere.

Status: This has been accomplished by the AIRS Science Team for non-polar regions (ocean and land areas) and is expected to be accomplished for the polar regions by the end of December 2006.

Individual AIRS Temperature Profile over the Chesapeake Bay (smooth curve) vs. a Radiosonde Profile (more jagged curve), for 9/13/2002



Global Temperature Profile Accuracies vs. Radiosondes, 9/2002 - 12/2004

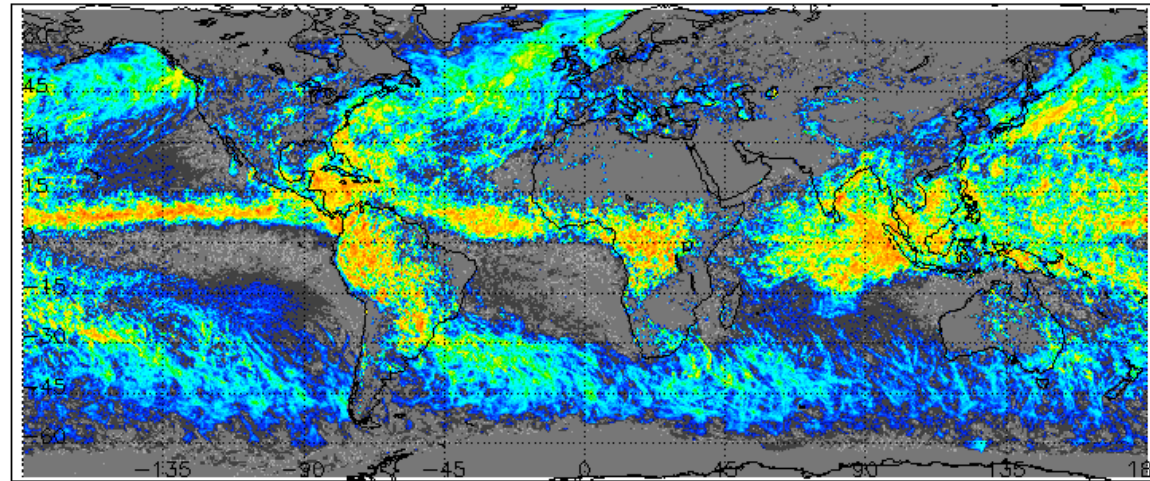


(plots from Wallace McMillan [left] and Murty Divakarla [right], obtained through Tom Pagano and Mous Chahine)

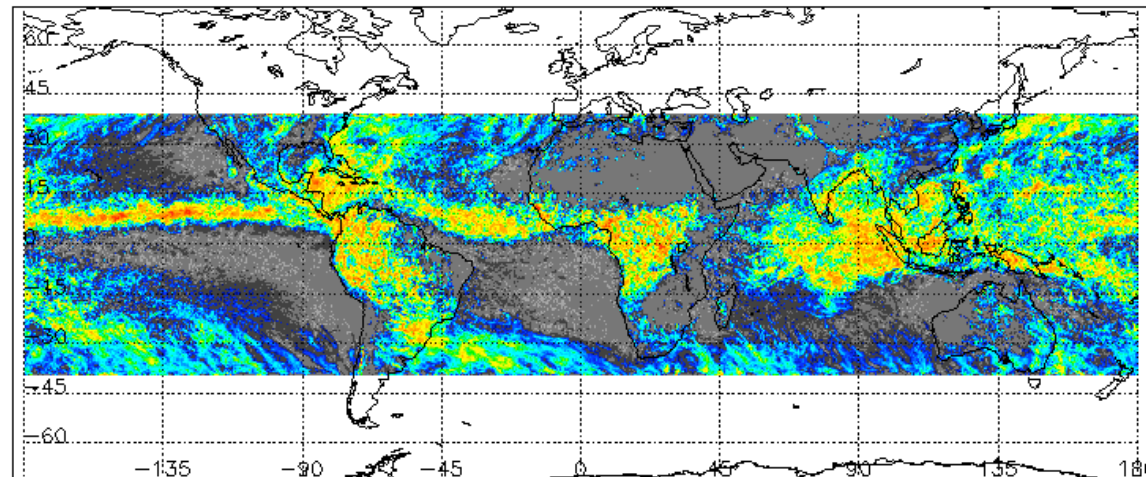
3. Extend the improved TRMM rainfall characterization to the extra tropics.

Status: This was accomplished by the AMSR-E Science Team in November 2002.

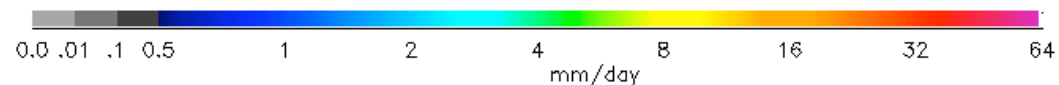
Aqua AMSR-E
October 2005
Rainfall



TRMM Microwave
Imager (TMI)
October 2005
Rainfall



(images from Chris Kummerow
and Ralph Ferraro)



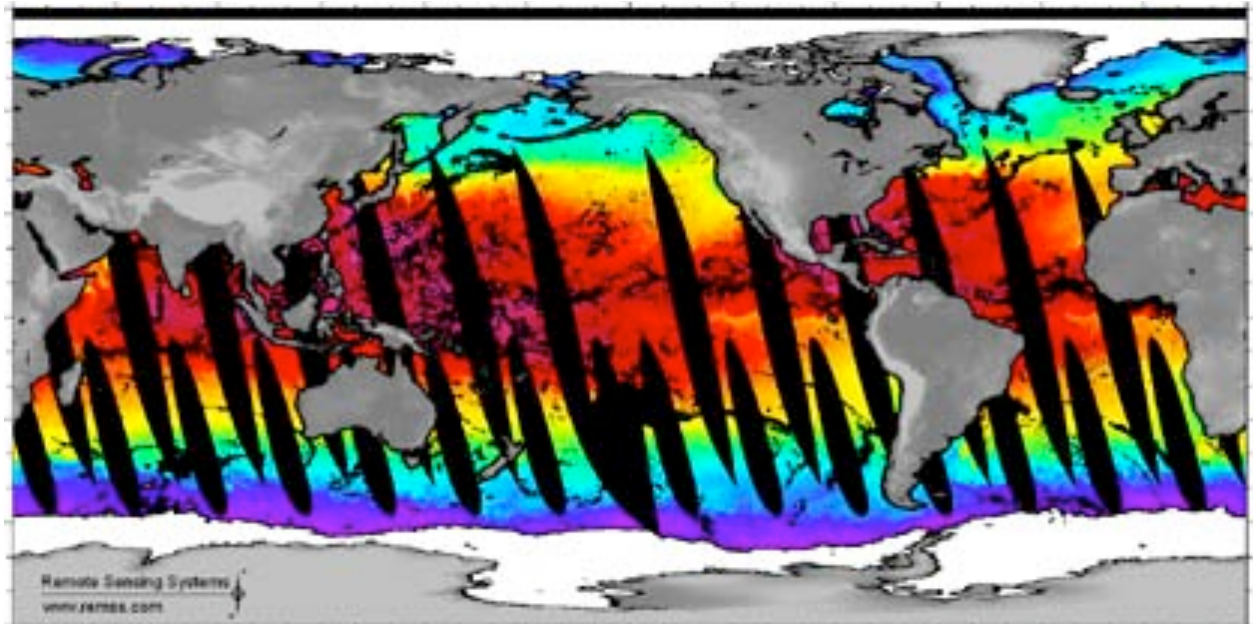
4. Produce the first global sea surface temperature daily maps under nearly all sky conditions for a minimum of 1 year.

Status: This was accomplished by the AMSR-E Science Team in December 2003.

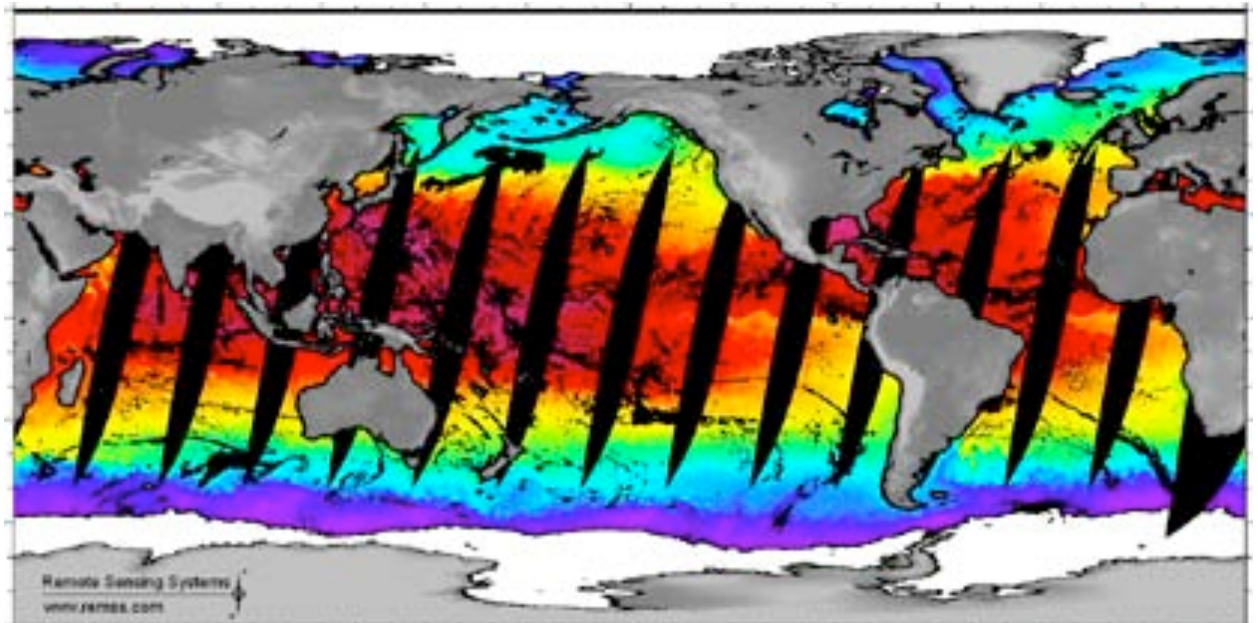
Details: The AMSR-E Science Team has now produced over four years of global sea surface temperature (SST) maps. These are available as daily ascending and descending images and as 3-day, weekly, and monthly average images. (Samples on next two slides.)

Sample Aqua AMSR-E Daily Sea Surface Temperature Images

August 1, 2006,
ascending passes

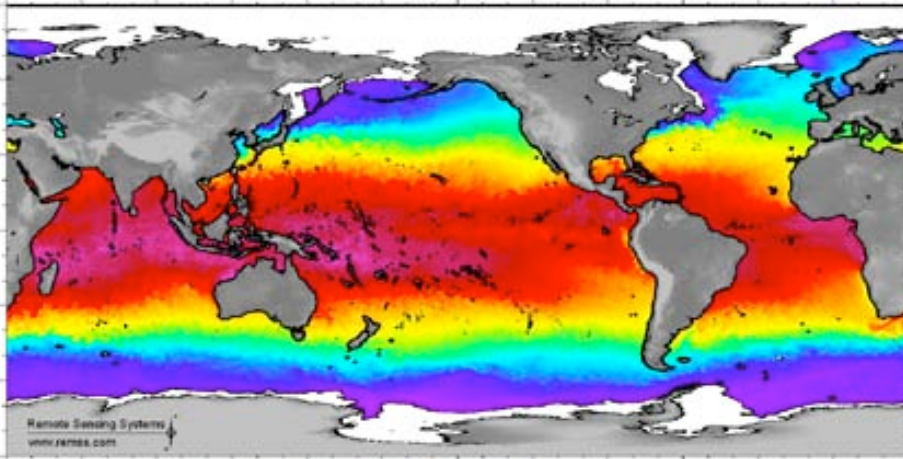


August 1, 2006,
descending passes

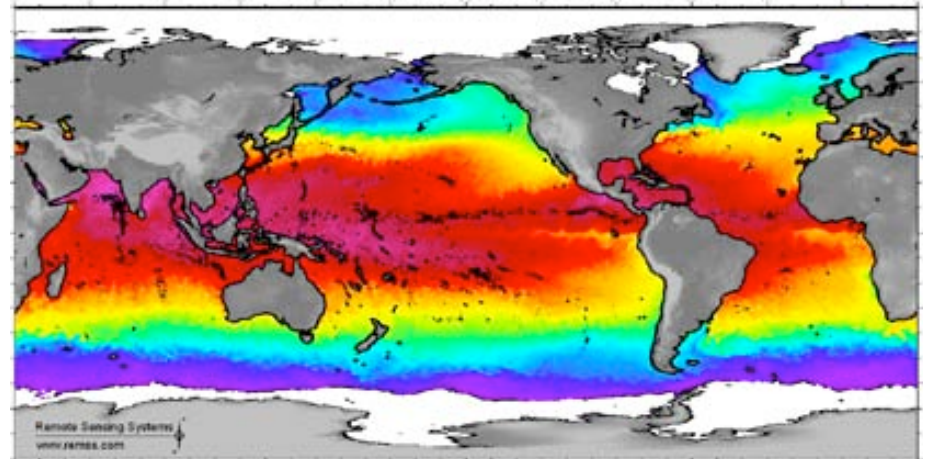


(images from Frank Wentz's
www.remss.com website)

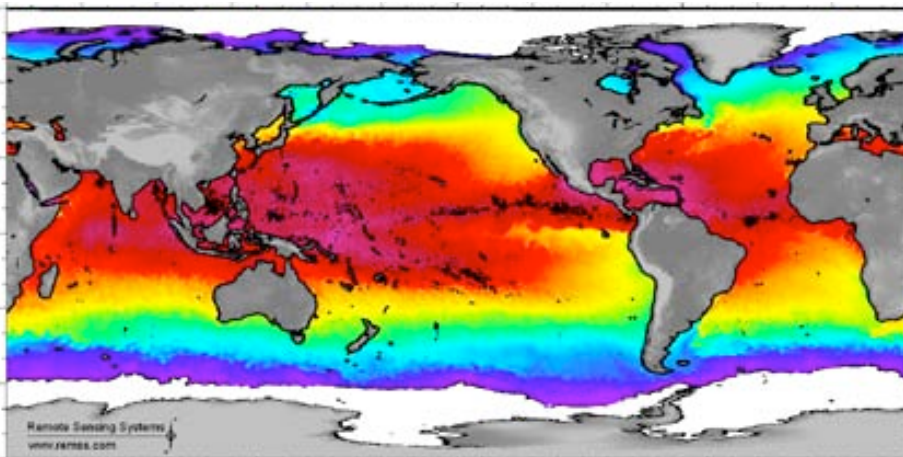
Aqua AMSR-E Seasonal Sea Surface Temperature 3-Day Images, 2005



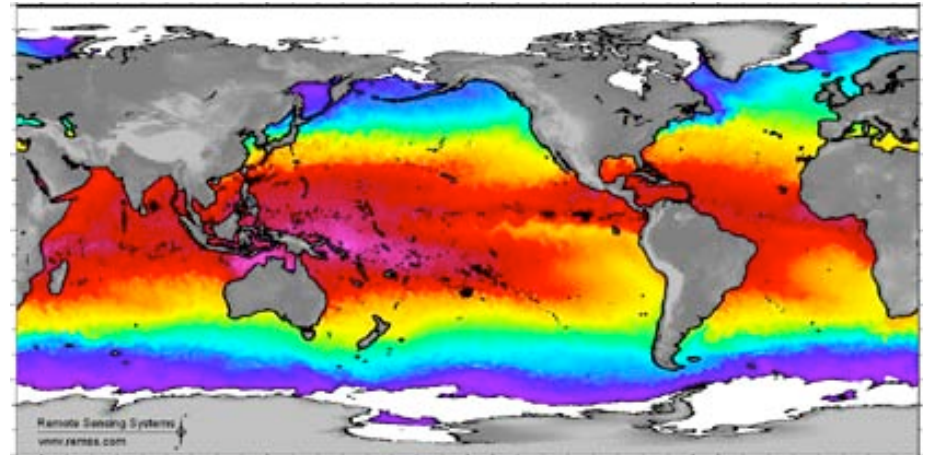
March 15-17, 2005



June 15-17, 2005



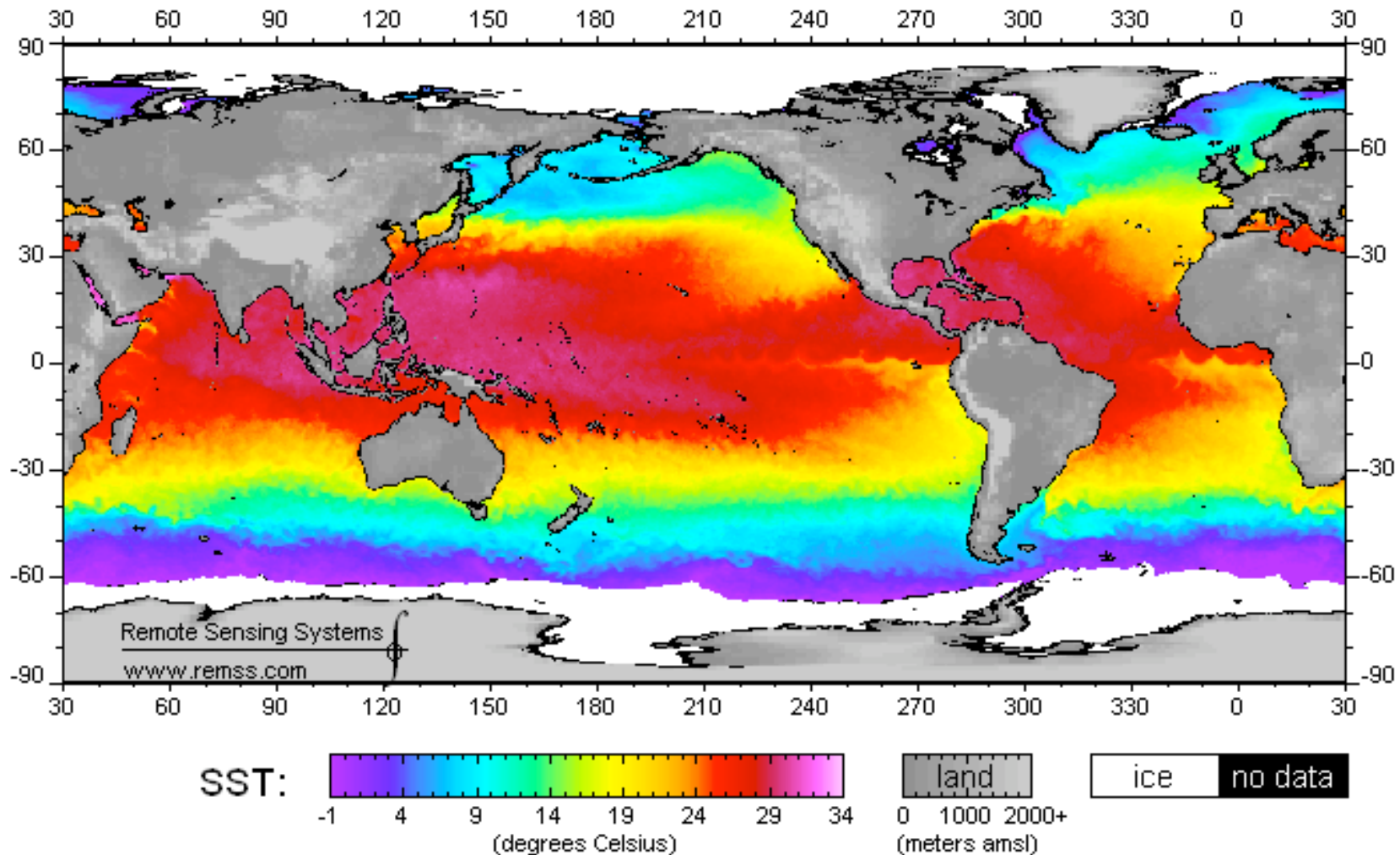
September 15-17, 2005



December 15-17, 2005

(images from Frank Wentz's www.remss.com website)

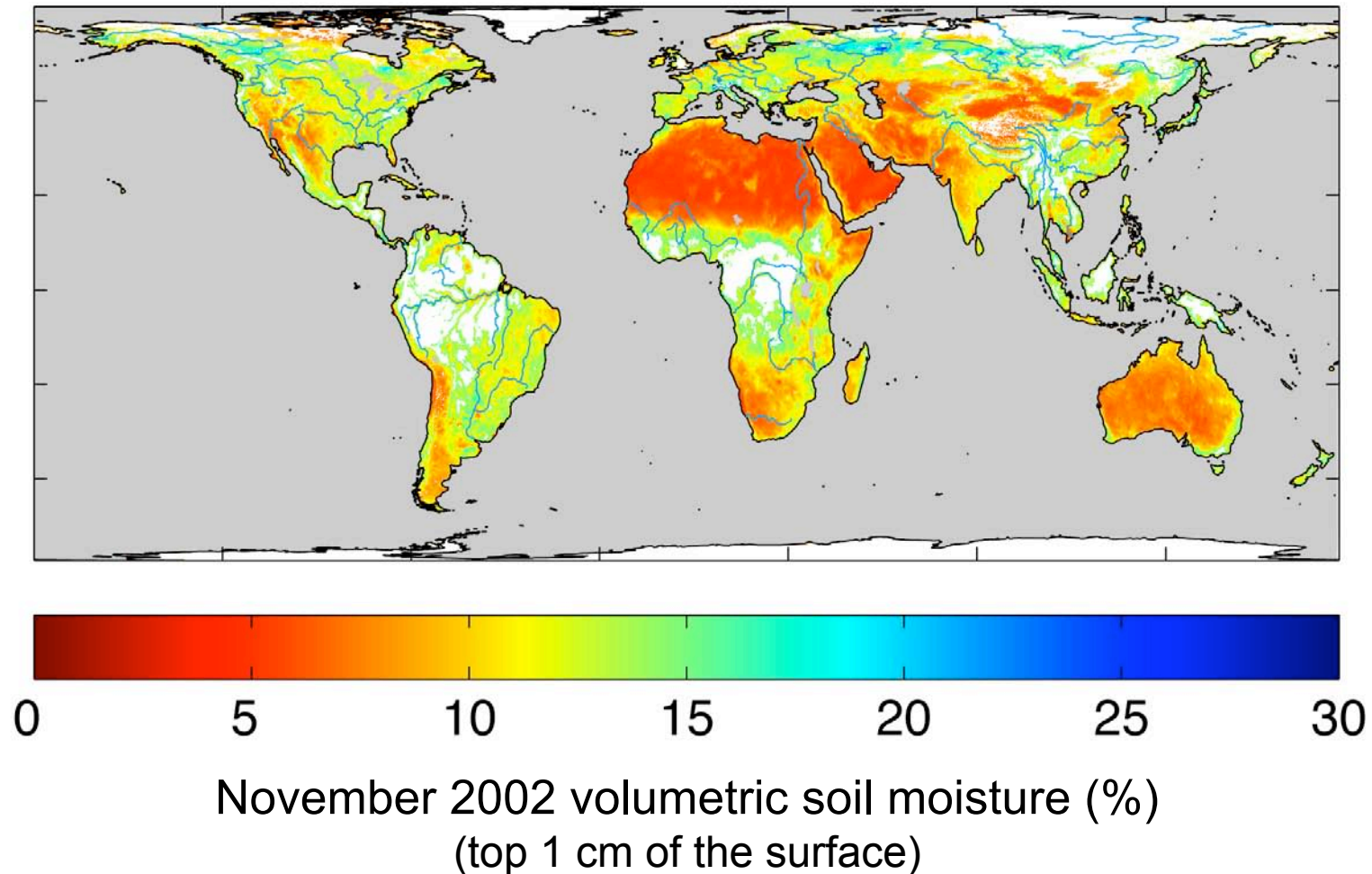
Sample Daily SST Image from the AMSR-E and the TRMM Microwave Imager (TMI), July 9, 2005



(from Remote Sensing Systems, through Elena Lobl)

5. Produce large-scale global soil moisture distribution for regions with low vegetation.

Status: This was accomplished by the AMSR-E Science Team.

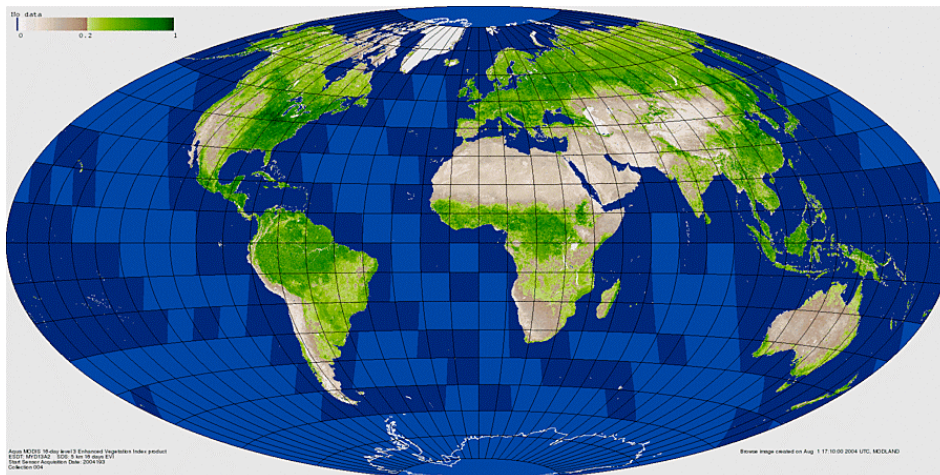


(image from Eni Njoku)

6. Produce calibrated global observations of the Earth's continents and ocean surfaces.

Status: This was accomplished by the MODIS Science Team.

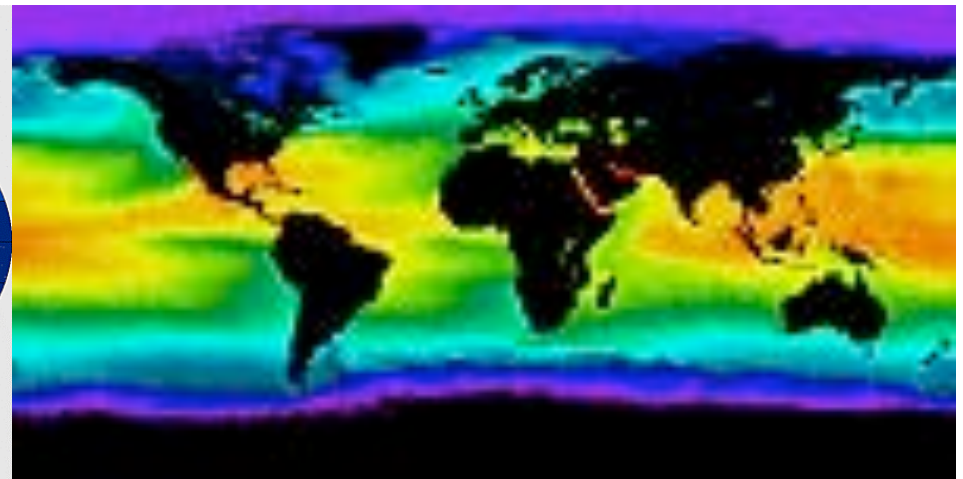
Land sample:
July 2004 enhanced vegetation index



0.0 0.2 0.4 0.6 0.8 1.0

Enhanced vegetation index (EVI)

Ocean sample:
July 2004 sea surface temperatures



Sea surface temperature (SST, °C)

(images from Vince Salomonson, from the MODIS website)

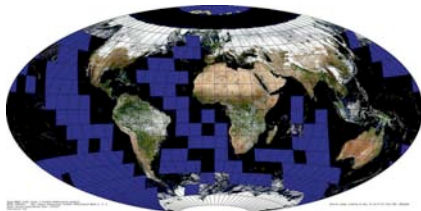
7. Capture and document two seasonal cycles of terrestrial and marine ecosystems and atmospheric and cloud properties.

Status: This was accomplished by the MODIS Science Team.

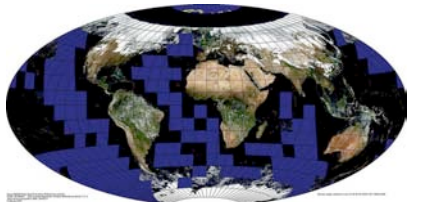
Details: By now, the MODIS Science Team has produced four seasonal cycles of approximately 40 global products. The next three slides illustrate two seasonal cycles for six variables.

Aqua MODIS Surface Reflectance and Enhanced Vegetation Index, 2004 and 2005

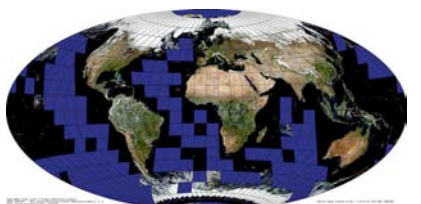
SFC REFL



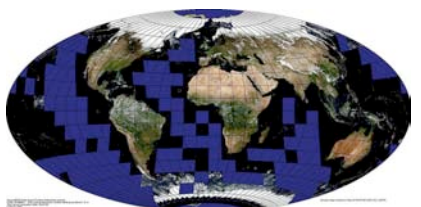
JANUARY 2004



JANUARY 2005



APRIL 2004



APRIL 2005

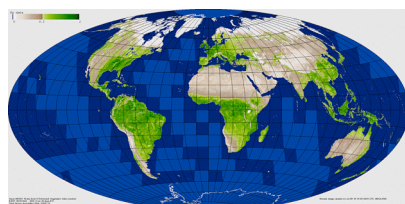
EVI



JANUARY 2004



JANUARY 2005

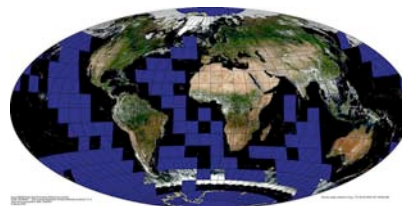


APRIL 2004

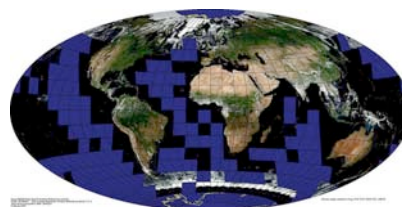


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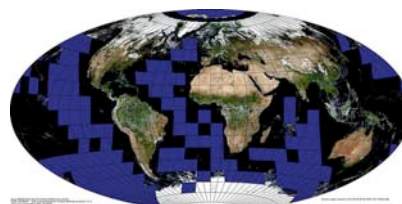
SFC REFL



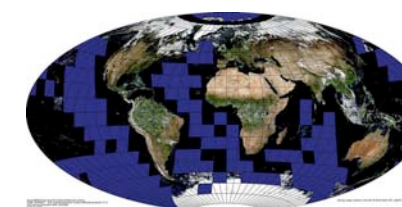
JULY 2004



JULY 2005

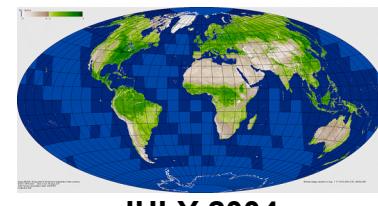


OCTOBER 2004

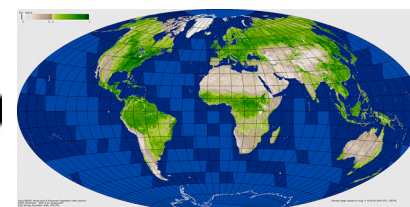


OCTOBER 2005

EVI



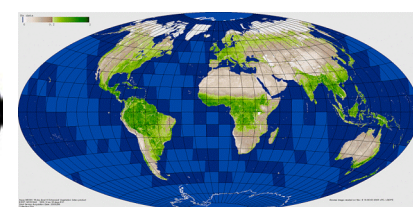
JULY 2004



JULY 2005



OCTOBER 2004

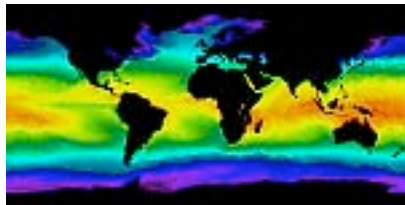


OCTOBER 2005

(images from Vince Salomonson, from the MODIS website)

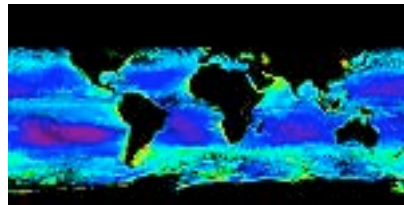
Aqua MODIS Sea Surface Temperature and Chlorophyll, 2004 and 2005

SST



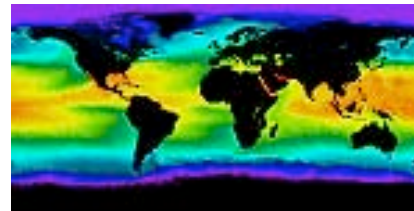
JANUARY 2004

CHLOROPHYLL



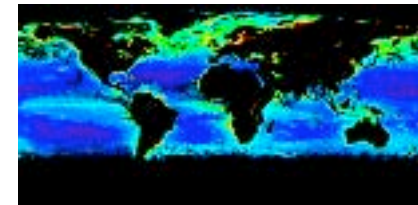
JANUARY 2004

SST

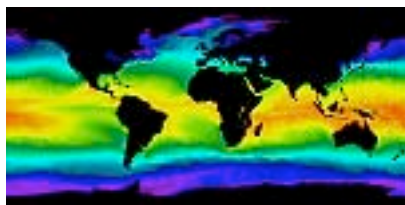


JULY 2004

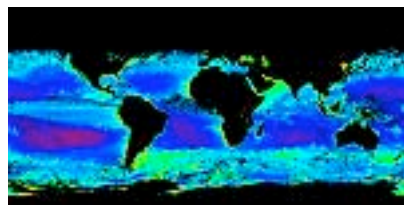
CHLOROPHYLL



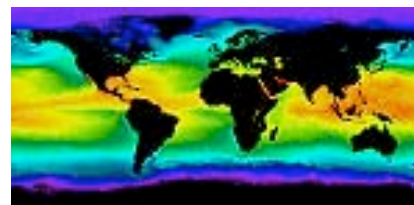
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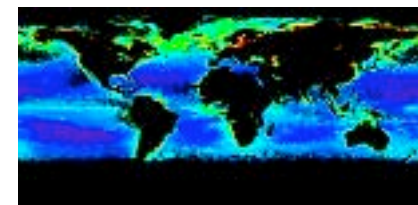
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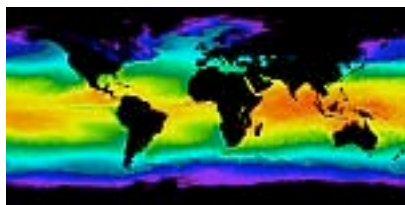
JANUARY 2005



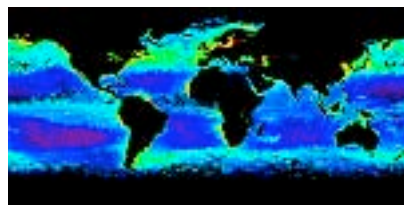
JULY 2005



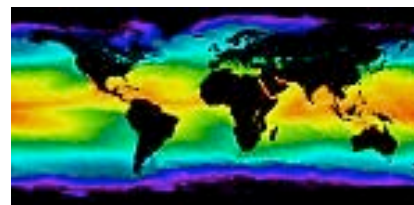
JULY 2005



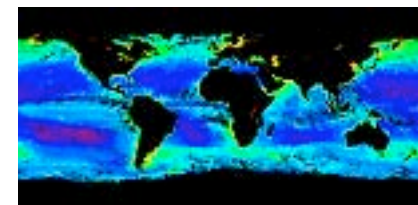
APRIL 2004



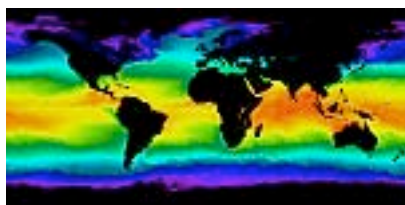
APRIL 2004



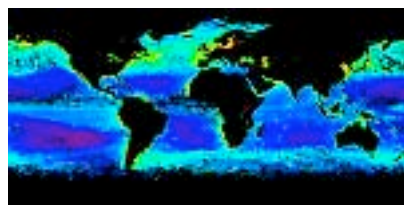
OCTOBER 2004



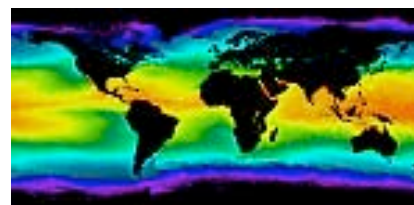
OCTOBER 2004



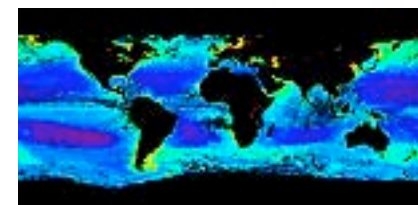
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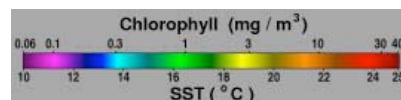
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OCTOBER 2005



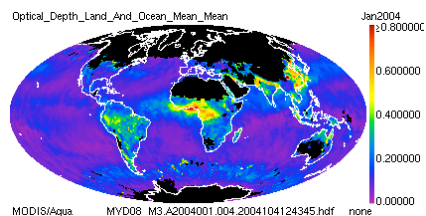
OCTOBER 2005



(images from Vince Salomonson,
from the MODIS website)

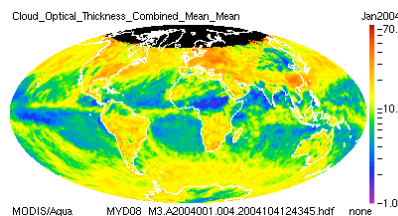
Aqua MODIS Aerosol and Cloud Optical Thickness, 2004 and 2005

AEROSOLS



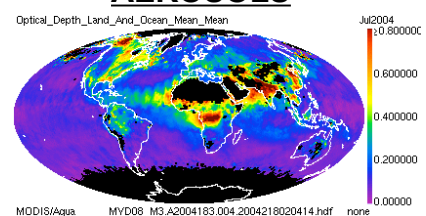
JANUARY 2004

CLOUDS



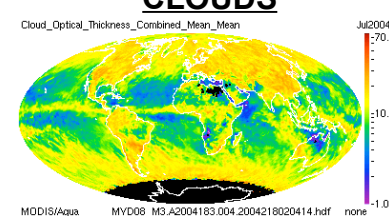
JANUARY 2004

AEROSOLS

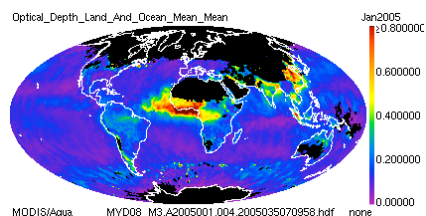


JULY 2004

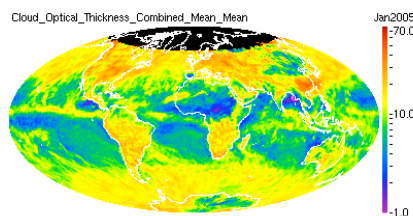
CLOUDS



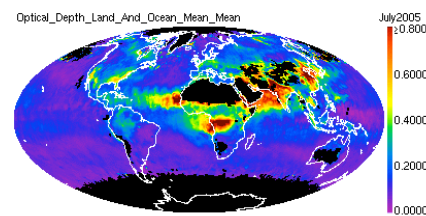
JULY 2004



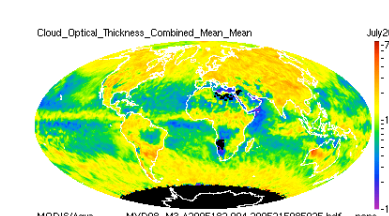
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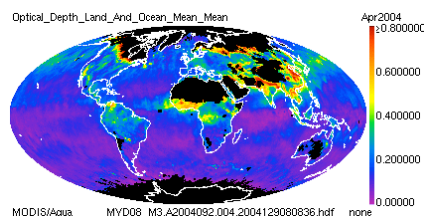
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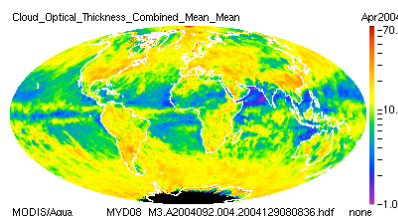
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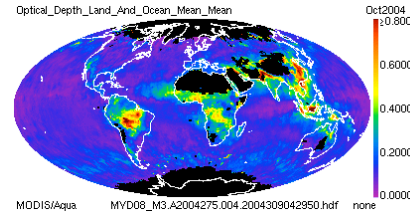
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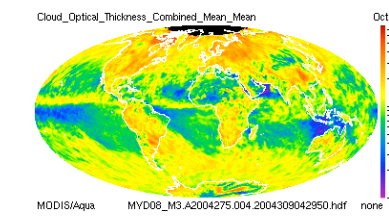
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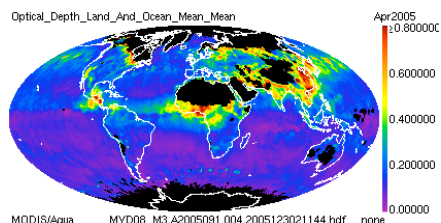
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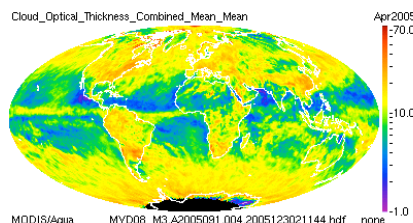
OCTOBER 2004



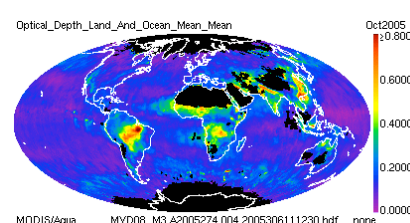
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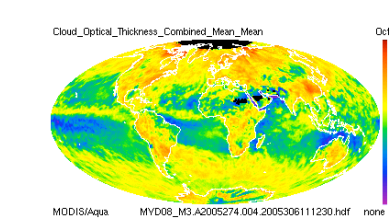
APRIL 2005



APRIL 2005



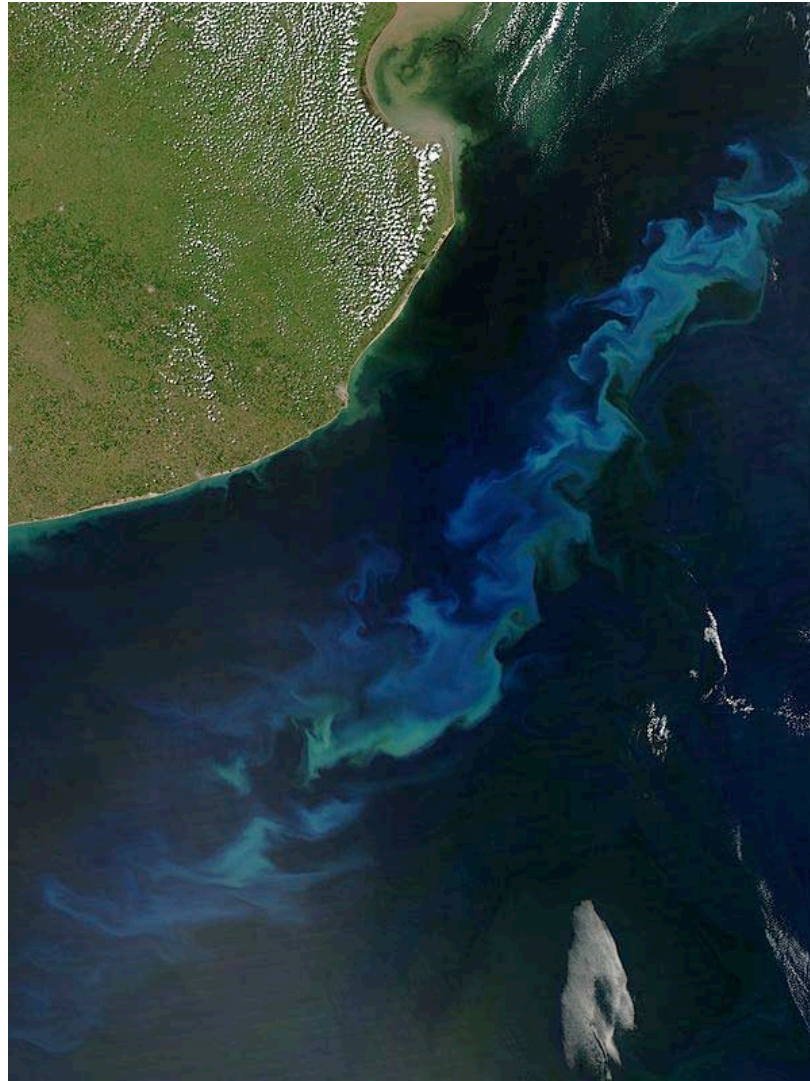
OCTOBER 2005



OCTOBER 2005

(images from Vince Salomonson, from the MODIS website)

Sample MODIS Close-Up: Phytoplankton Bloom Off Argentina, March 5, 2006

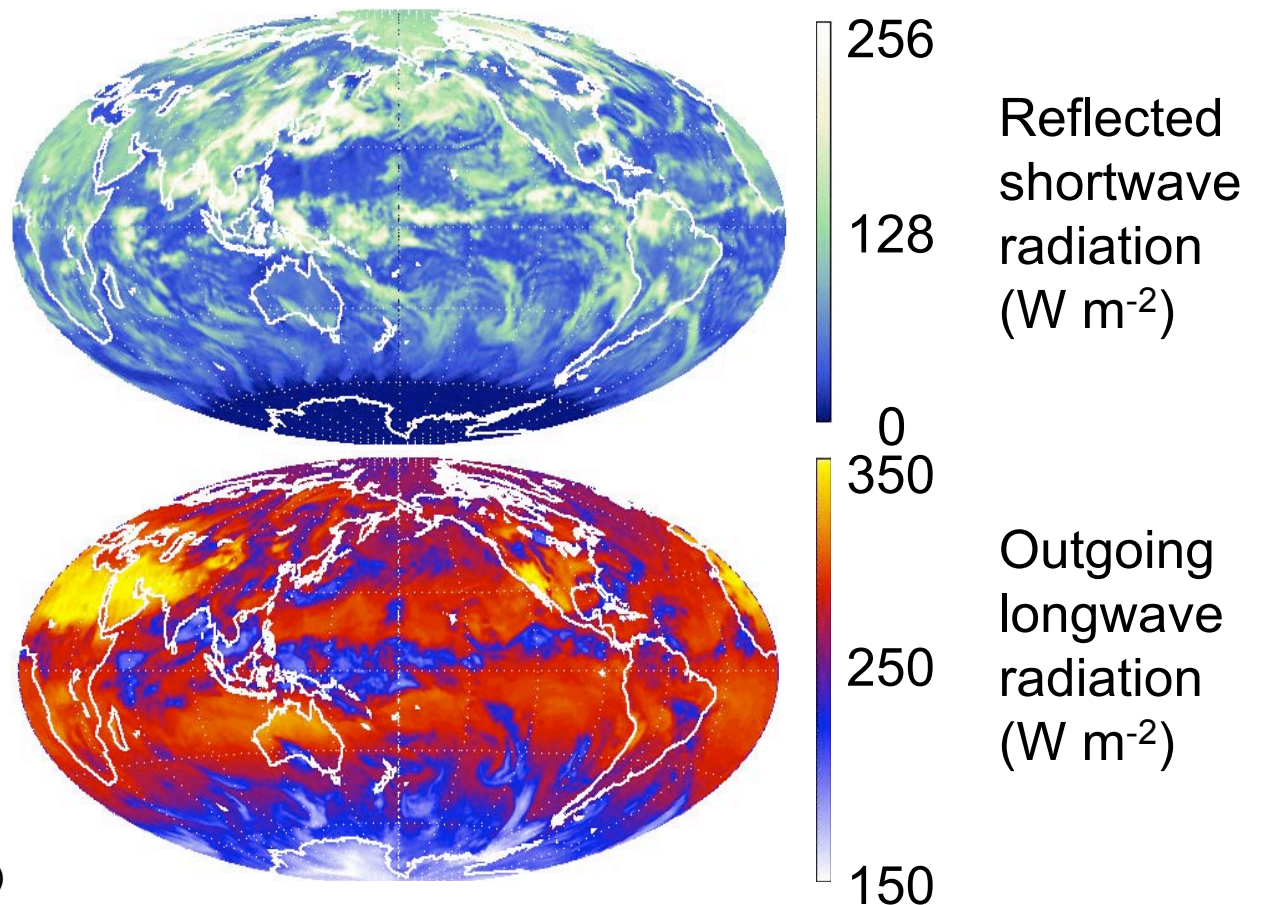


(from Chuck McClain, Gene Feldman, and the MODIS Science Team)

8. Produce two seasonal/annual Earth radiation budget records.

Status: This has been accomplished by the CERES Science Team for ERBE-like radiative fluxes, Levels 1-3, and for Levels 1-2 of the more advanced data products. It is expected to be accomplished for Level 3 of the more advanced products by December 2007.

Sample ERBE-Like
Level 3 Global Images
from the Aqua CERES,
for June 22, 2002



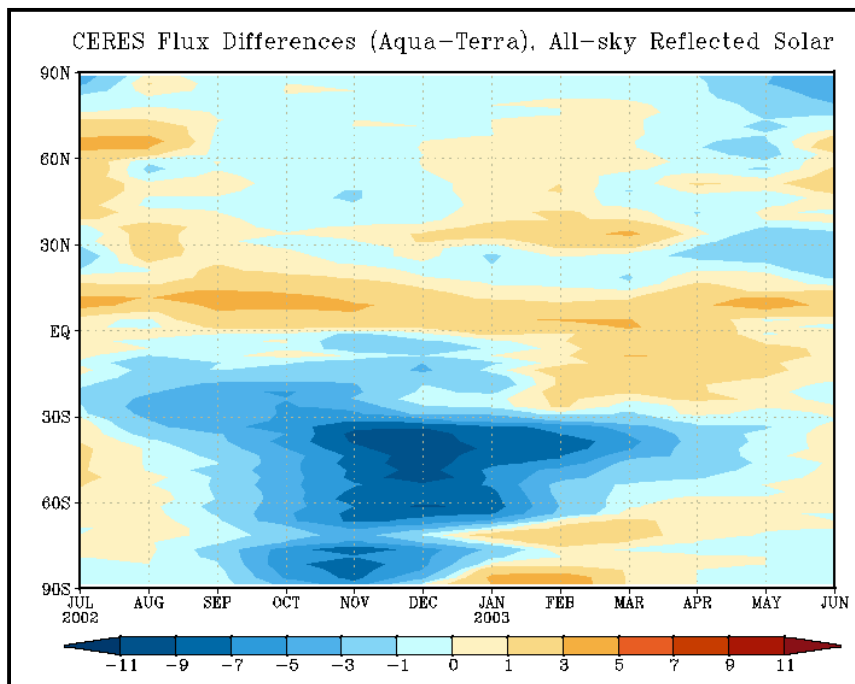
(images from the CERES Science Team)

9. Produce improved measurements of the diurnal cycle of radiation by combining Aqua and Terra measurements.

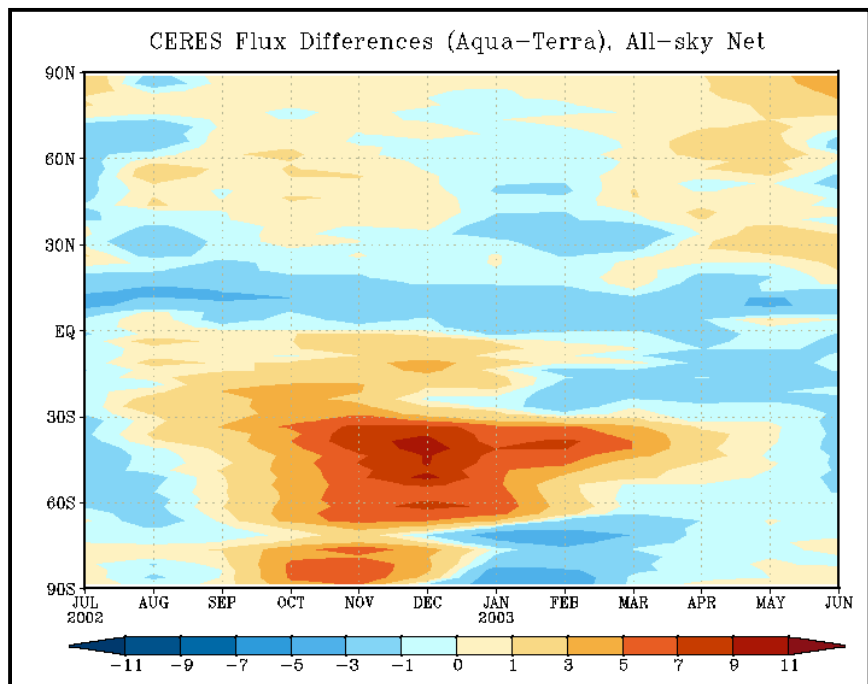
Status: This has been accomplished by the CERES Science Team for the ERBE-like top-of-the-atmosphere data products and should be accomplished for the advanced Level 3 data products by the end of 2008.

Sample Diurnal Cycle Information from Aqua and Terra CERES Data, showing top of the atmosphere flux differences for July 2002 - June 2003

Shortwave flux difference (Aqua-Terra)



Net flux difference (Aqua-Terra)

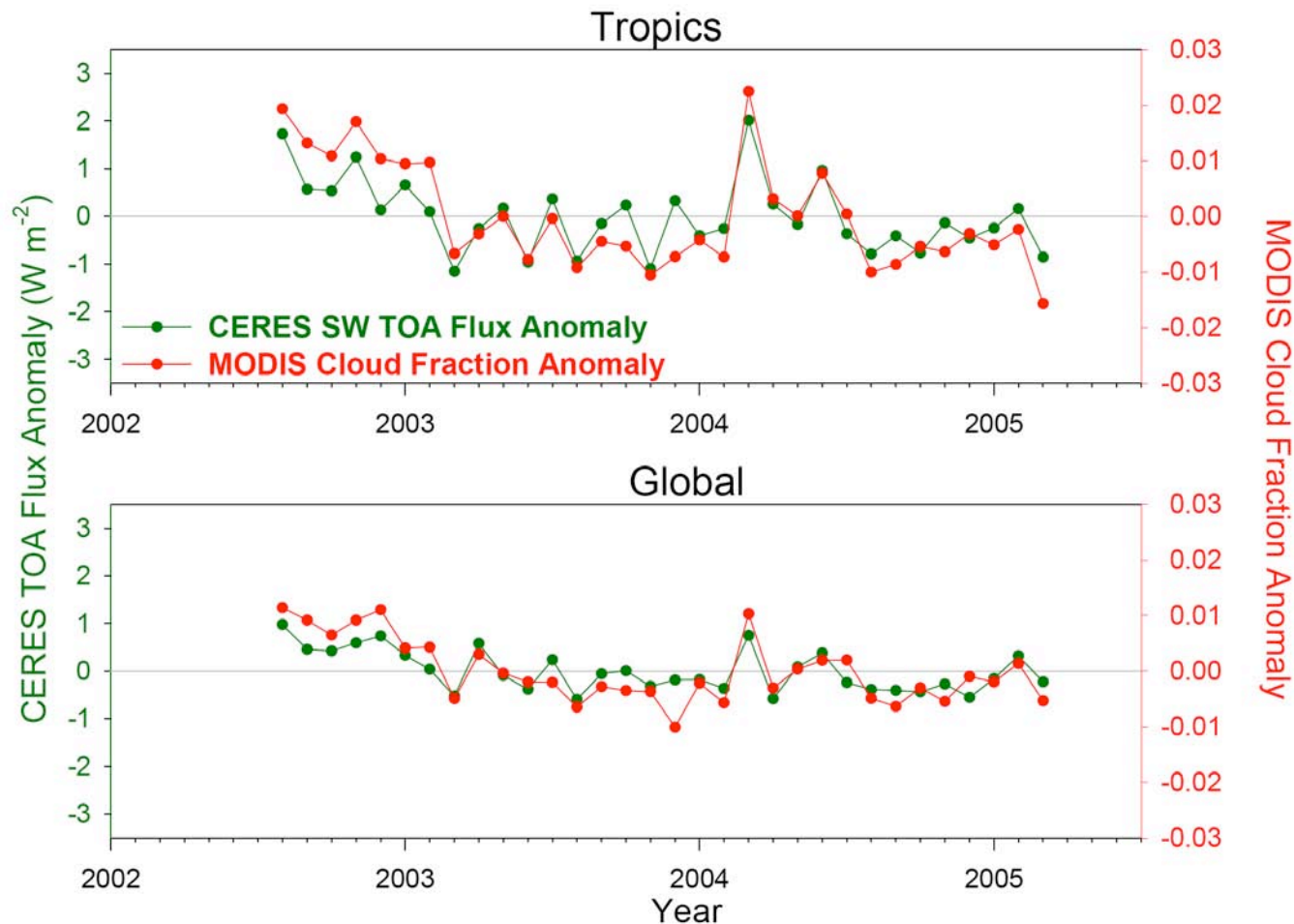


(images from Tak Wong, Norm Loeb, and the CERES Science Team)

10. Produce combined cloud property and radiation balance data to allow improved studies of the role of clouds in the climate system.

Status: The CERES Science Team has created a 3.5-year Level 2 data product that combines Aqua CERES top-of-the-atmosphere fluxes and surface flux estimates with (a) aerosol and cloud properties from MODIS, (b) temperature/humidity/wind profiles from the Goddard Earth Observation System (GEOS) version 4.0.3, (c) snow and sea-ice maps from MODIS and Special Sensor Microwave Imager (SSM/I) measurements, (d) surface cover maps from the International Geosphere-Biosphere Program (IGBP), and (e) aerosol assimilation products from the National Center for Atmospheric Research (NCAR). However, a sequence of further improvements and additions is planned, with the anticipation that Criterion 10 will be fully satisfied in 2008.

Sample Comparison of Aqua CERES Radiative Data and Aqua MODIS Cloud Property Data, showing CERES shortwave top-of-the-atmosphere flux anomalies and MODIS cloud fraction anomalies for mid-2002 through early 2005



(plots from Norm Loeb, Bruce Wielicki, and the CERES Science Team)

